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Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

**“पुराने को छोड़ नये के तरफ”**

Jawaharlal Nehru

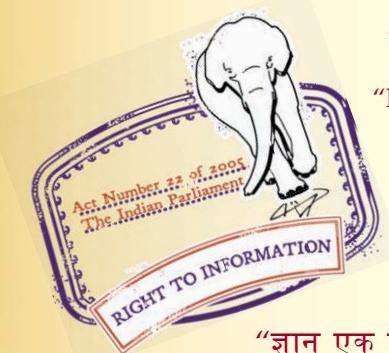
“Step Out From the Old to the New”

IS 11000-1-1 (1988): Fire hazard testing, Part 1: Guidance for the preparation of requirements and test specifications for assessing fire hazard of electronic and electrical items, Section 1: General guidance [LITD 1: Environmental Testing Procedure]

**“ज्ञान से एक नये भारत का निर्माण”**

Satyanaaran Gangaram Pitroda

“Invent a New India Using Knowledge”



**“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”**

Bhartṛhari—Nītiśatakam

“Knowledge is such a treasure which cannot be stolen”





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*Indian Standard*  
**FIRE HAZARD TESTING**

**PART 1 GUIDANCE FOR THE PREPARATION OF REQUIREMENTS  
AND TEST SPECIFICATIONS FOR ASSESSING FIRE HAZARD OF  
ELECTRONIC AND ELECTRICAL ITEMS**

**Section 1 General Guidance**

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# *Indian Standard*

## FIRE HAZARD TESTING

### **PART 1 GUIDANCE FOR THE PREPARATION OF REQUIREMENTS AND TEST SPECIFICATIONS FOR ASSESSING FIRE HAZARD OF ELECTRONIC AND ELECTRICAL ITEMS**

#### **Section 1 General Guidance**

#### **0. FOREWORD**

**0.1** This Indian Standard ( Part 1/Sec 1 ) was adopted by the Bureau of Indian Standards on 14 March 1988, after the draft finalized by the Environmental Testing Procedures Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

**0.2** The risk of fire is present in any electrical circuit which is energized. With regard to this risk, the objective of component circuit and equipment design and the choice of material shall be such as to reduce the likelihood of fire even in the event of foreseeable abnormal use, malfunction or failure. The practical aim shall be to prevent ignition due to the electrically energized part but, if ignition and fire occur, to control the fire preferably within the bounds of enclosure of electronic and electrical item.

**0.3** This standard is intended as guidance to other Technical Committees and may be used in part or whole with respect to their individual applications. However, Technical Committees

in actual practice may accept some concepts in whole while departing from others in order to control the hazard relating to their specific applications more adequately.

**0.4** While preparing this standard, considerable assistance is derived from IEC 695-1-1 ( 1982 ) 'Fire hazard testing — Part 1 : Guidance for the preparation of requirements and test specifications for assessing fire hazard of electrotechnical products — General guidance', issued by the International Electrotechnical Commission ( IEC ).

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

\*Rules for rounding off numerical values ( revised ).

#### **1. SCOPE**

**1.1** This standard ( Part 1/Sec 1 ) covers general guidance for the preparation of requirements and test specifications for assessing fire hazard of electronic and electrical items.

#### **2. HAZARD CONCEPTS**

**2.1** Care should be taken to minimize the risk of electronic and electrical items causing a fire by electrically induced ignition within the item. Unusual external events such as the outbreak of a fire in the environment or deliberate misuse of electronic and electrical items contrary to the operating instructions and conditions for its use, shall in general be disregarded as a basis for fire hazard requirements.

**2.2** Certain electronic and electrical items such as large enclosures, insulated cables and conduits, may in fact replace large portions of surfaces and finishing materials of building construction. In these circumstances, the surfaces of

the electronic and electrical items, when exposed to an external fire, need to be considered to ensure that they do not contribute to the risk of fire spread, smoke, etc, to a greater degree than is permitted for the building materials and structures which are replaced.

**2.3** Consideration should also be given to toxicity, opacity and corrosivity of significant quantities of smoke and other emissions from a burning product, but these hazards are secondary in nature and interrelated to combustibility factors. Relevant test methods are under development.

**2.4** The emission of gases may also, under certain circumstances, lead to a risk of explosion.

#### **3. ASPECTS FOR EVALUATION OF SEVERITY OF A FIRE HAZARD**

**3.1** The severity of a fire hazard is basically determined by the likelihood of harm to life and damage to property if a fire starts and develops in an uncontrolled manner.

<i>Basic Aspects</i>	<i>Severity of Fire Hazard</i>		<i>Particular Aspects</i>	<i>Severity of Fire Hazard</i>	
	high		low		
a) Harm to life	likely	unlikely	iii) Maintenance and inspection	none	regular
b) Damage to property	major	minor	iv) Mobility of product	fixed portable	hand-held

**3.2** The following list shows some aspects which need particular attention for each item when specifying requirements and test severities related to fire hazard testing:

<i>Particular Aspects</i>	<i>Severity of Fire Hazard</i>	
	high	
a) Environmental conditions:		low
i) Ambient temperature	high	low
ii) Dust and humidity (tracking)	present	none
iii) Atmospheric pressure	high	low
iv) Association with combustibles*	uncontrolled	none
v) Fire/explosion risk	present	none
b) Installation conditions:		
i) Controlled available power	high	low
ii) Voltage	high	low
iii) Connection to supply	non-polarized	polarized
iv) Overvoltage and surges on supply mains	high	low
v) Association with combustibles†	close	separated
vi) Fire detecting and extinguishing devices	none	installed
vii) Height of building	high	low
viii) Position in building	inside	outside
c) Use conditions :		
i) Attendance by operator	none	continuous
ii) Experience of operator	layman	qualified

\*For example, furniture/furnishings, textiles, packaging and display materials, rubbish, dust.

†For example, building materials and structures, furniture/furnishings.

iii) Maintenance and inspection	none	regular
iv) Mobility of product	fixed portable	hand-held
v) Connection of supply	continuous	temporary
vi) Duration of use	long	short

**NOTE —** The above list is not exhaustive and as regards some aspects assessment of fire hazard should be left to individual expert judgement of the circumstances concerned.

#### 4. MAIN OBJECTIVES

**4.1** In order to design an electronic and electrical item with an acceptable characteristic with regard to prevention of fire hazard there shall be clear objectives.

**4.2** Careful attention shall be paid to permissible mechanical, electrical and thermal stresses so as to minimize the possibility of fire hazard under conditions of normal use, foreseeable abnormal and faulty operation conditions.

**4.3** The required properties of electronic and electrical items, their sub-assemblies and components, along the hazard concepts as outlined in 2, can be achieved:

- a) by using parts and/or circuit-design and protection which under overload of failure are *not likely to ignite or to cause ignition*, and/or
- b) by using parts, including enclosures, which are *sufficiently resistant* to probable ignition sources and heat within an electronic and electrical items, and/or
- c) by design such that propagation of fire and spread of flame are adequately restricted.

**4.4** Selection of *materials, components and sub-assemblies*, special means of *installation and operation* can all be applied to fulfil the requirements along the hazard concepts according to 2.

**4.5** A *limited level of ignitability* for parts of electronic and electrical items may be defined where appropriate, usually as a basic requirement.

#### 5. TYPES OF FIRE TESTS

**5.0** Technical Committees engaged in the preparation of requirements and test specifications

with regard to fire hazard of electronic and electrical items are mainly interested in the following types of tests.

**5.1 Hazard Assessment Tests** — These tests examine the behaviour of electronic and electrical items, often full size, and are aimed to be as representative as possible, of the use of the item in practice. Since the real conditions of use (including foreseeable abnormal use, malfunction or failure) of a product are simulated as closely as possible and the design of the test procedure is related to the actual risks, such tests assess the relevant aspects of the fire hazard associated with the use of an item. 'Hazard assessment test' is a new term for such types of tests which are in common use, by safety authorities and others, in codes and regulations.

The findings of such tests may not be valid when a change of design is made or when the conditions of use are changed from those simulated in the test.

**5.2 Combustion Characteristic Tests** — These tests examine the behaviour of standardized specimens under defined conditions and are used in most cases to give data on properties related to burning behaviour and for comparative evaluation. The data provided by such combustion characteristic tests are usually not representative for other conditions to which the specimen may be subjected.

Combustion characteristic tests can be quite useful when designed to simulate as closely as possible the situation to which a material or part may be exposed in actual use. They may then lead to proper selection of materials, components, and parts which will meet the appropriate requirement when testing the complete product.

## 6. PREPARATION OF REQUIREMENTS AND TEST SPECIFICATIONS

**6.0** When preparing requirements and test specifications with regard to fire hazard testing of electronic and electrical items it is suggested that the committees follow the procedure shown below.

In case where fire tests are not yet specified and need to be developed or altered for the special purpose of any other technical committee, this should be done in close liaison with the committee responsible for the preparation of this standard.

### 6.1 Procedure

- Establish the need for a test, its type and identify the main objectives.
- Examine the known existing and recommended test procedures developed for a similar purpose and their possible suitability and shortcomings.
- Collect as much background information as possible on the fire aspects to which

the tests can be related and take into account the relevant scope and significance of the existing test procedures.

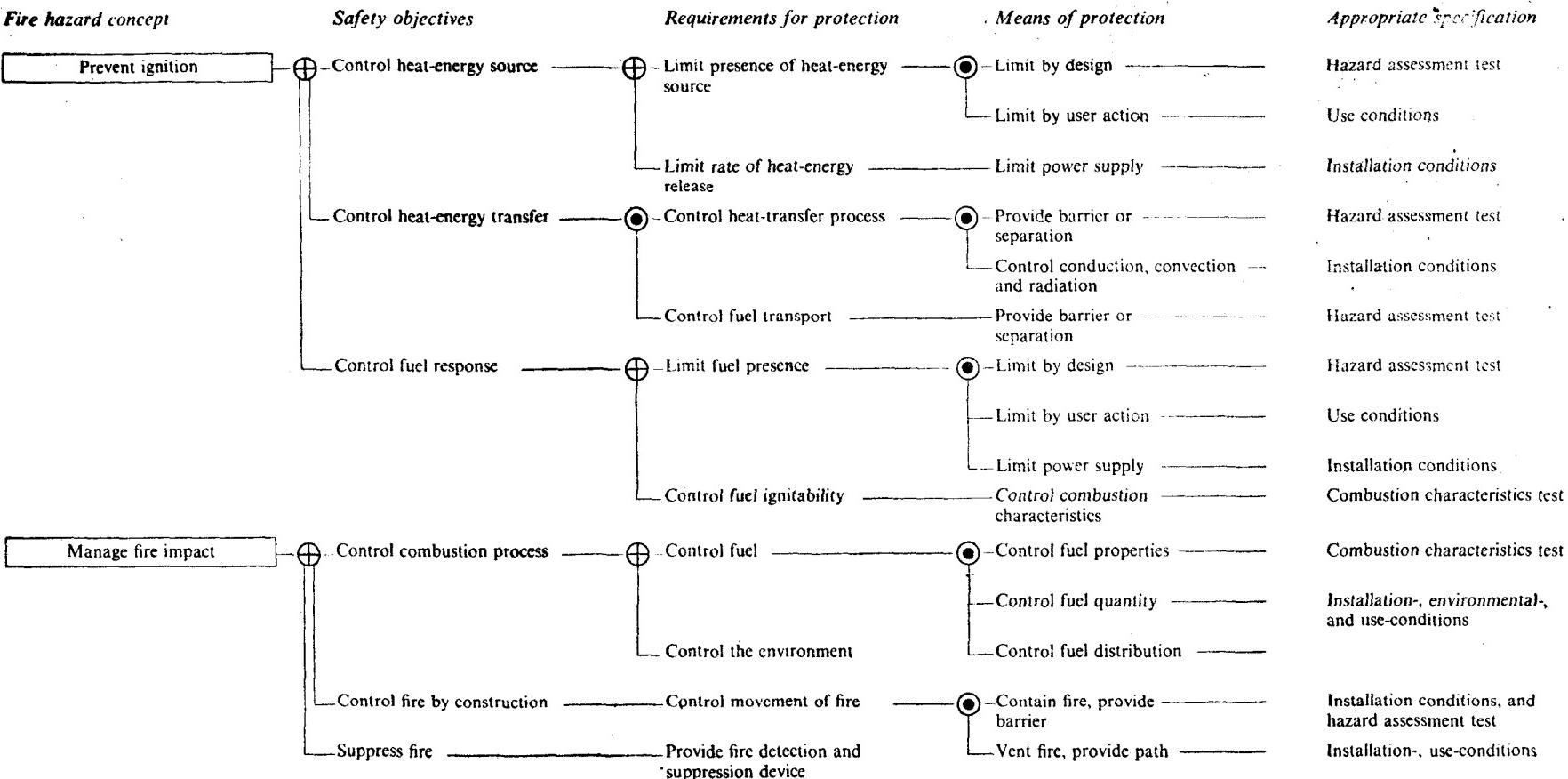
- If an existing test procedure appears suitable, check its provisions against the following features:
  - Environmental Conditions** — In practice simplifications become necessary but the conditions finally adopted should bear as much relationship as possible to the environment which is being modelled.
  - Realistic Examination** — The validity of test data is related to the manner of use and installation of the item and its association with other items.
  - Discrimination** — Those properties and characteristics of the test procedure which are of interest should be checked for their sensitivity, reproducibility and repeatability.
  - Expression of Results** — The test results shall be given in easily understood terms giving a fully objective description. All indefinite (subjective) phraseology shall be avoided.
- If a new test procedure is to be developed, quantify the essential features as listed above. Further important features are the purpose of the test, the limitations of the test, the use of the information it provides, and the ease of operation.
- Specify acceptance criteria appropriate to the resistance to ignition and propagation of fire of the tested item.
- Undertake an investigation of the proposed test procedure and study its ability to meet the objectives.
- Prepare the standard for the test method including the relevant information on its field of application, its limitations and reservations, and on the use of the test results obtained. Make reference in the standard to a recommended test procedure wherever possible.

**6.2 Terminology** — It is recommended that all technical committees:

- use the latest vocabulary and definitions in the field of fire tests, and
- avoid merely descriptive phraseology, such as 'fiercely burning, easily ignitable, non-combustible', etc, which may be misleading in the field of fire hazard testing.

**6.3 Decision Tree** — As far as the hazard concepts of 2 are concerned, the preparation of requirements and test specifications with regard to fire hazard testing of electronic and electrical items can be facilitated and the presence of intended and appropriate measures can be verified by taking into consideration the decision tree given in Appendix A.

**APPENDIX A**  
*( Clause 6.3 )*  
**DECISION TREE FOR REQUIREMENTS AND SPECIFICATIONS**



⊕ "or"-gate.

○ "and/or"-gate.